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NEW IDEAS

from Hewlett-Packard Company • Palo Alto, California

PRECISION QUARTZ OSCILLATORS

The extremely high stability of Hewlett-Packard Model 103AR and 104AR Quartz Oscillators has made them widely used references wherever precision frequency and time signals are needed. Both instruments have a guaranteed long term stability of 5 parts in 10^{10} per day, and a short term stability of 1 part in 10^{10} can be confidently expected under normal laboratory conditions. The two oscillators each have 1 mc and 100 kc outputs, and the Model 104AR also has a 5-mc output exhibiting outstanding spectral purity.

Both oscillators are currently available on short-term delivery, and prices are now $1900 for the Model 103AR and $2300 for the Model 104AR.

For up-to-date delivery information, call your Hewlett-Packard Engineering Representative.

AC POWER SUPPLIES

Hewlett-Packard now manufactures dc-to-ac static inverters, voltage regulators and frequency changers to handle your ac power supply requirements.

A typical instrument, the Model 4301 Frequency Changer, is shown above. Providing continuously adjustable voltage from 0 to 130 volts (2 amps max.) or 0 to 260 volts (1 amp max.) with a variable frequency from 40 to 2,000 cps, the Model 4301 is priced at $1350. For complete specifications on this instrument, please contact your Hewlett-Packard Engineering Representative or check the enclosed card.

1963 IRE SHOW SNEAK PREVIEW

Each March, many interesting and significant new developments are revealed at the New York IRE Show. Although it is a bit early to discuss details, here are a few hints about new Hewlett-Packard instruments due to make their appearance this year. Look for:

- An instrument providing a wide range of accurate, easily selected frequencies.
- New instruments to speed and to simplify voltage measurement.
- The "most versatile counter ever introduced"!

Intrigued? We'll have the details on these and other new instruments in your hands by March 15th or so. And we'll see you on "Easy Street," 3rd floor, New York Coliseum, March 25-28.

STEP RECOVERY DIODES

Hewlett-Packard affiliate, –hp associates–, announces the availability of Step Recovery Diodes (also called "Boff" diodes) commercially. Providing minority carrier lifetimes of up to 500 nsec and transition times of less than 2 nsec, these diodes are ideal for pulse shaping networks, harmonic generators, and computer circuitry applications. For detailed information, please contact –hp associates– directly at 2900 Park Boulevard, Palo Alto, California.

THE RF MILLIVOLTMETER

The Hewlett-Packard Model 411A RF Millivoltmeter is a real advance in the measurement art. A straight-forward device, the Model 411A features linear meter scales for easy reading, and a temperature compensated probe to minimize drift on even the most sensitive range. This is the ideal instrument for accurately measuring 3 millivolts to 10 volts in the frequency range from 500 kc to 1 gc — all for $450!

Your Hewlett-Packard Engineering Representative will be happy to discuss with you both the features of the Model 411A and the current delivery

situation (presently very good) — or if you prefer, simply check the enclosed card to receive detailed specifications.

NEW MICROWAVE BOOK

In August of last year, Prentice-Hall, Inc. (leading publisher of textbooks) released a new book called *Microwave Theory and Measurements*. Designed as a practical introduction to the basic microwave measuring techniques, the text has been well received in many educational circles.

If your work involves scholastic or industrial training in making microwave measurements—or if you would just like to "brush-up," you will find this book a valuable aid.

Priced at $8.95, this book is available only from Prentice-Hall, Inc. (College Order Department, Englewood Cliffs, New Jersey), or your neighborhood bookstore. We are just mentioning it because *Microwave Theory and Measurements* was authored by the Engineering Staff of the Hewlett-Packard Microwave Division!

New Instruments Now Available For Fast Delivery*

175A OSCILLOSCOPE

The Hewlett-Packard Model 175A Oscilloscope has a fast, 7 nsec "at the probe" rise time measurement capability (50 mc), dual plug-in versatility, and operator convenience usually found only in low frequency oscilloscopes—all at a competitive price! The fastest sweep speed (10 nsec/cm) permits viewing the scope rise time over almost a full horizontal centimeter of display, giving plenty of margin for observing high frequency signals.

Eight vertical amplifier *and* horizontal time base plug-in units provide the utmost versatility for the Model 175A. Typical units include high gain 40 mc dual trace and 50 mc single channel vertical plug-ins, and delayed sweep and time mark generators for specialized timing measurements. A novel display scanner plug-in can drive X-Y recorders for large, faithful plots of repetitive waveforms, or it can be used in digitizing fast waveforms.

The Model 175A features a full 6 x 10 cm display (a 50% increase over prior types) combined with an "in-focus" trace, and no-parallax, no-glare viewing. New sync circuits lock in signals with minimum adjustment, and a push button beam finder quickly locates off-screen traces. An X10 magnifier permits examining traces in detail.

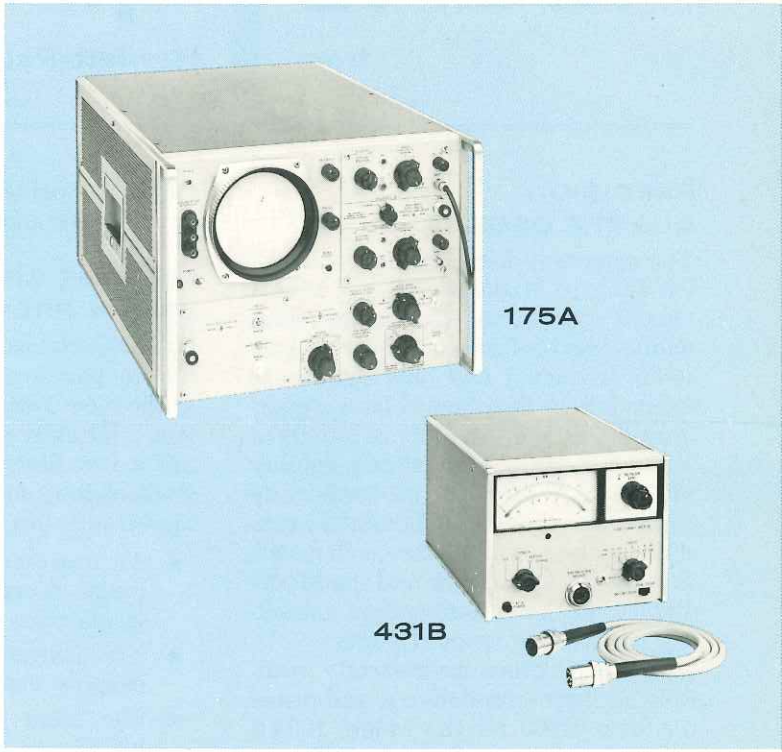
Built for years of maximum reliability, the Model 175A is easy to maintain. The vertical amplifier and delay line have only four frequency adjustments, providing maximum amplifier gain stability (no complicated distributed amplifiers, multi-adjustment lumped-constant delay lines, or selected tubes are used). A completely solid state, highly regulated power supply permits stable operation over wide changes of line voltage. Careful design has kept rf interference to a minimum, making the Model 175A suitable for use near sensitive receivers.

Model 175A Oscilloscope (without plug-ins): $1325
Plug-in Units ..... $25-$425

431B POWER METER

The Hewlett-Packard Model 431B Power Meter offers unprecedented stability for making power measurements from 1 microwatt to 10 milliwatts. Two self-balancing bridges with associated measuring thermistors are used; one bridge and thermistor sense and measure rf power while the other bridge and thermistor correct the meter reading for ambient temperature changes.

Full scale readings of 10 μw to 10 mw are covered in seven ranges, with a bridge accuracy of $\pm$3%. The



companion thermistor mounts used with the Model 431B cover the frequency range from 10 mc to 40 gc (coaxial from 10 mc to 10 gc, and waveguide from 2.6 to 40 gc).

The linear-scaled meter is easy to read, and the grounded recorder output is linear with measured power. In addition to making long-term records of power vs. time practical, the exceptional stability of the Model 431B can be utilized in conjunction with a Model H01-8401A Leveler Amplifier for stabilizing BWO and TWT rf generators. Another companion instrument, the Model 8402A Power Meter Calibrator, is available for making precise measurements (bridge accuracy within $\pm$.5%) with the Model 431B through dc power substitution methods.

Model 431B Power Meter
(without thermistor mounts) ..... $ 425

Temperature Compensated Thermistor
Mounts ..... $145-$375

5245L ELECTRONIC COUNTER

Hewlett-Packard Model 5245L Electronic Counter accurately measures frequency up to 50 mc without

* Your Hewlett-Packard Engineering Representative has up-to-date delivery information on these instruments.

5245L

310A

plug-ins, and up to 512 mc with the appropriate plug-in unit! Other measurements include: Period; Multiple Period Averaging; Ratio; Scaling; and Time Interval.

Only 5¼ inches high, this instrument has plug-in versatility not found in other electronic counters. In addition to the two frequency converters which extend the Model 5245L's basic frequency range to 512 mc, a third plug-in unit permits the precise measurement of time intervals from 1 μsec to 10^8 sec in duration.

The heart of the Model 5245L is a new oven-controlled crystal time base, which has a stability of ± 3 parts in 10^9 per day and is often used as a frequency standard. (This stability means that the Model 5245L need not be calibrated as often as other counters, too.) Conservative design and careful consideration of both temperature and line voltage variations have produced an instrument which is accurate under varying conditions. The stability and accuracy of the basic counter are retained when using the plug-in units.

Operator efficiency is improved through the use of closely-spaced digital display tubes, and by display storage (display changes only if the new count differs from the old, and the change is made directly without the familiar "run-through"). Both the unit of measurement and the decimal point are automatically displayed for all measurements. All displayed information is available through a 1-2-2-4 BCD output connector for recording, remote indication, etc.

Model 5245L Electronic Counter (without plug-ins)	$3250
Model 5251A Frequency Converter (20-100 mc)	$ 300
Model 5253A Frequency Converter (88-512 mc)	$ 500
Model 5262A Time Interval Unit	$ 300

A companion counter, the Model 5243L has all of the features mentioned above, except that the basic counting rate is 20 mc instead of 50 mc: $2950 (without plug-ins).

310A HIGH FREQUENCY WAVE ANALYZER

The Hewlett-Packard Model 310A High Frequency Wave Analyzer provides a convenient way to determine and analyze a signal's fundamental, harmonics, or intermodulation products. A versatile instrument, the Model 310A can also function as an efficient tuned voltmeter for accurately measuring relative or absolute signal levels, as a signal source for selective response measurements, and as either an AM receiver or carrier re-insertion oscillator for demodulating sideband signals.

Frequency tuning is continuous and linear throughout the entire 1 kc to 1.5 mc range, and can be easily read from the highly visible 4-place digital dial. Resolution is better than 200 cps over the band, and any setting is accurate to $\pm(1\% + 300$ cps). The high sensitivity of 10 μv (full scale) combined with the wide dynamic range of 75 db permits measurements of weak harmonic components down to 1 μv or strong signals up to 100 v. Voltage accuracy is $\pm 6\%$ full scale.

Features of the Model 310A include: AFC for tracking input signals drifting up to 100 cps/second; three passbands of 200 cps, 1000 cps and 3000 cps; a dc output for recording measurements; and restored signal frequency output. Both the voltmeter and a beat-frequency oscillator are simultaneously tuned by the Analyzer's frequency dial, providing a convenient means of exciting a test circuit and measuring its response.

Model 310A High Frequency Wave Analyzer: $2000

For complete specifications, please contact your Hewlett-Packard Engineering Representative (listed on the last page)—or simply return the postage-paid card enclosed for your convenience.

All prices f.o.b. factory. Data subject to change without notice.

Your HEWLETT-PACKARD Engineering Representative provides a broad range of services.

He commands the most complete line of electronic instruments in the United States, and he will be happy to discuss *any* measuring problem with you!

**Asterisks indicate Field Service Centers* *Parenthesis (000) indicate Telephone Area Code*

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